CLAIMS

What is claimed is:

1.   A method for correlating behavior between two elements of a system to determine the presence of mutual interaction between the elements, the method comprising:

measuring the behavior of two elements of a system over time with respect to mutual interaction, thereby producing two behavior functions;

expressing a plurality of constraints on a theoretical distance c between said behavior functions; and

determining that said elements are behaving as mutually interacting elements where there exists an actual distance c satisfies said constraints.

2.   A method according to claim 1 wherein said expressing step comprises maintaining an upper bound and a lower bound on said theoretical distance c, and wherein said determining step comprises determining where said lower bound is smaller than or equal to said higher bound for any of said constraints.

3.   A method according to claim 1 wherein said expressing step comprises expressing each of said constraints using at least two time-consecutive samples (a_n, a_{n+1}) of one of said functions and at least one sample (b_n) of the other of said functions that is time-intermediate said time-consecutive samples.

4.   A method according to claim 3 wherein said expressing step comprises expressing each of said constraints as $(a_n - b_n) \leq c \leq (a_{n+1} - b_n)$.

5.   A method according to claim 1 wherein said expressing step comprises expressing each of said distances using at least two time-consecutive samples (a_n, a_{n+1}) of one of said functions and at least one sample (b_n) of the other of said functions that is taken at the same time as one of said time-consecutive samples.

6.   A method according to claim 5 wherein said expressing step comprises expressing each of said constraints as $(a_n - b_n) \le c \le (a_{n+1} - b_n)$.

7.   A method for correlating behavior between two elements of a system to determine the presence of mutual interaction between the elements, the method comprising:

measuring the behavior of two elements of a system over time with respect to mutual interaction, thereby producing two behavior functions;

expressing a plurality of constraints for a plurality of theoretical distances c_i between said behavior functions; and

determining that said elements are behaving as mutually interacting elements where there exists a plurality of actual distances c_i that satisfies said constraints.

8.   A method according to claim 7 wherein said expressing step comprises maintaining an upper bound and a lower bound on each of said plurality of theoretical distances c_i, and wherein said determining step comprises determining where said lower bound is smaller than or equal to said higher bound for any of said constraints.

9.   A method according to claim 7 wherein said expressing step comprises:

expressing each of said constraints using a plurality of samples a_n of one of said functions taken at times $a^t_1, a^t_2 \dots, a^t_n$, a first plurality of time-consecutive samples b_n and a second plurality of time-consecutive samples b'_n of the other of said functions taken at times $b^t_1, b^t_2 \dots, b^t_n$, wherein $a^t_1 \le b^t_1 \le a^t_2 \le b^t_2 \le \dots a^t_n \le b^t_n.$; and

selecting each of said constraints from of a set of constraints defined by the pattern:

$$a_1 - b_1 \le c_1 \le a_2 - b_1$$
$$a_2 - b_2 \le c_2 \le min(a_2 - b_1 + P(b'_2 - b'_1), a_3 - b_2)$$
$$a_3 - b_3 \le c_3 \le min(a_2 - b_1 + P(b'_3 - b'_1), a_3 - b_2 + P(b'_3 - b'_2), a_4 - b_3).$$

10

10.   Apparatus for correlating behavior between two elements of a system to determine the presence of mutual interaction between the elements, the apparatus comprising:

means for measuring the behavior of two elements of a system over time with respect to mutual interaction, thereby producing two behavior functions;

means for expressing a plurality of constraints on a theoretical distance c between said behavior functions; and

means for determining that said elements are behaving as mutually interacting elements where there exists an actual distance c satisfies said constraints.

11.   Apparatus according to claim 10 wherein said expressing means comprises means for maintaining an upper bound and a lower bound on said theoretical distance c, and wherein said determining means comprises means for determining where said lower bound is smaller than or equal to said higher bound for any of said constraints.

12.   Apparatus according to claim 10 wherein said expressing means comprises means for expressing each of said constraints using at least two time-consecutive samples (a_n, a_{n+1}) of one of said functions and at least one sample (b_n) of the other of said functions that is time-intermediate said time-consecutive samples.

13.   Apparatus according to claim 12 wherein said expressing means comprises means for expressing each of said constraints as $(a_n - b_n) \le c \le (a_{n+1} - b_n)$.

14.   Apparatus according to claim 10 wherein said expressing means comprises means for expressing each of said distances using at least two time-consecutive samples (a_n, a_{n+1}) of one of said functions and at least one sample (b_n) of the other of said functions that is taken at the same time as one of said time-consecutive samples.

15.   Apparatus according to claim 14 wherein said expressing means comprises means for expressing each of said constraints as $(a_n - b_n) \le c \le (a_{n+1} - b_n)$.

11

16.　　Apparatus for correlating behavior between two elements of a system to determine the presence of mutual interaction between the elements, the apparatus comprising:

　　means for measuring the behavior of two elements of a system over time with respect to mutual interaction, thereby producing two behavior functions;

　　means for expressing a plurality of constraints for a plurality of theoretical distances c_i between said behavior functions; and

　　means for determining that said elements are behaving as mutually interacting elements where there exists a plurality of actual distances c_i that satisfies said constraints.

17.　　Apparatus according to claim 16 wherein said expressing means comprises means for maintaining an upper bound and a lower bound on each of said plurality of theoretical distances c_i, and wherein said determining means comprises means for determining where said lower bound is smaller than or equal to said higher bound for any of said constraints.

18.　　Apparatus according to claim 16 wherein said expressing means comprises:

　　means for expressing each of said constraints using a plurality of samples a_n of one of said functions taken at times $a^t_1, a^t_2 ..., a^t_n$, a first plurality of time-consecutive samples b_n and a second plurality of time-consecutive samples b'_n of the other of said functions taken at times $b^t_1, b^t_2 ..., b^t_n$, wherein $a^t_1 \leq b^t_1 \leq a^t_2 \leq b^t_2 \leq ... a^t_n \leq b^t_n .$; and

　　means for selecting each of said constraints from of a set of constraints defined by the pattern:

$$a_1 - b_1 \leq c_1 \leq a_2 - b_1$$
$$a_2 - b_2 \leq c_2 \leq min(a_2 - b_1 + P(b'_2 - b'_1), a_3 - b_2)$$
$$a_3 - b_3 \leq c_3 \leq min(a_2 - b_1 + P(b'_3 - b'_1), a_3 - b_2 + P(b'_3 - b'_2), a_4 - b_3).$$

12